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V. *On the changes which have taken place in the declination of some of the principal fixed Stars.* By JOHN POND, Esq. *Astronomer Royal, F. R. S.*

Read April 18, 1822.

THE mural circle having in September last been put into complete repair, and declared by Mr. TROUGHTON to be in as perfect a state as when first erected, I resumed my examination of the principal fixed Stars which form the Greenwich Catalogue. In the course of a very short time, I found that several anomalies, which had previously given me much perplexity, still subsisted : some of these were of such a nature as to lead to a suspicion that a change might possibly have taken place in the figure of the instrument ; on the other hand, there were circumstances, that strongly militated against such a supposition.

Several of the stars in which the supposed discordance appeared the greatest, passed over almost the same divisions with others, in which no such discordance could be perceived. Moreover, in examining these discordances in different points of view (that is, both with respect to their right ascensions and polar distances) I fancied I perceived something like a general law, that was quite incompatible with any possible hypothesis of error in the instrument.

On a point of this importance, I clearly saw the necessity of devising some new method of observation which might

decide with certainty, that which otherwise would become an endless subject of doubt and conjecture.

I had often attempted to observe the altitudes of stars by means of an artificial horizon of quicksilver, or other fluid, but had abandoned the attempt from the difficulty of protecting it from the wind, and from the number of observations I lost in fruitless experiments. To this method I had again recourse; and by means of wooden boxes of different sizes and figures, according to the different altitudes of the stars, I have sufficiently accomplished my purpose. A very few observations were sufficient to convince me that the instrument was in every respect perfect, and that I might repose the greatest confidence in every result it gave.

Several stars, and particularly those most discordant, I have observed by this new method, and find their places, without any exception, to agree within a fraction of a second, with those determined by direct measurement from the pole.

Presuming that the observations\* which accompany this paper will remove every shadow of a doubt as to the accuracy of the instrument, I shall now proceed to state, in as few words as possible, the nature of the changes which appear to me to have taken place since the year 1812.

If BRADLEY'S catalogue of stars for the year 1756, be compared with the Greenwich catalogue for 1813, it will be possible to deduce the annual variation for each star for the mean period, or for the year 1784, on the supposition of uniformity in the proper motion of each star; then allowing for the change of precession for each star, a catalogue may

\* Vide Appendix.

be computed for any distant period ; as for example, the present year 1822. Suppose such a catalogue computed, which I have named a predicted catalogue ; then, if this be compared with the observed catalogue for the same year, the following differences will be found to subsist between them.

The general tendency of all the stars will be to appear to the south of their predicted places, and this tendency seems to be greater in southern than in northern stars ; if any star be found north of its predicted place, it will always be a star north of the zenith, and the quantity of its motion extremely small. There may be observed a much greater tendency to southern motion in some parts of the heavens than in opposite, or distant parts as to right ascension, and in much the greater portion of the heavens the southern motion seems to prevail. A southern star, as Sirius, situated in that part of the heavens most favourable for southern motion, will be found more to the south of its predicted place than Antares, situated in the part least favourable for southern motion, though it is itself more southward.

Several stars have moved more from their predicted places than other neighbouring stars ; when this happens, the motion is always southward ; I have yet met with no exception to this rule ; not a single star can be found having an *extra* tendency to northern motion ; and indeed the northern motion in any star is so very small, that it would never have excited attention.

A very great deviation will be found in three very bright stars, Capella, Procyon, and Sirius : the proper motion of each of these is southward ; it therefore follows that these proper motions are accelerated. The proper motion of Arc-

turnus is very great, and likewise southward. It is situated in that part of the heavens where the southern tendency is least discernible, and is nearly quiescent ; its proper motion in polar distance may therefore be considered as uniform. There is a circumstance that deserves notice, though it may be merely accidental : the stars in the Greenwich catalogue, whose proper motions are south, nearly equal in number those that are north, yet the *quantity* of southern proper motion exceeds the northern in the proportion of four to one.

I shall at present offer no conjecture on the cause of these deviations, but endeavour, by continued observations, more accurately to ascertain the law which they follow. Should the weather prove favourable for observation, I hope before the Society separate for the summer, to be able to give greater accuracy to the numbers here subjoined. Indeed I should not have made so early a communication on the subject, but as the Greenwich observations of 1820 are about to be published, they might without this explanation have appeared erroneous ; for I find that during that year the instrument was rather defective from general unsteadiness, than from any perceptible deviation of the telescope. It was not till after the month of February, 1821, that the instrument got completely out of repair. It must however be admitted, that the observations of that year ought not to be employed in the determination of such small quantities as form the subject of the present communication.

*Horizontal point of the Circle as found by different Stars observed by direct vision and reflection, from 11th to 23rd March, 1822.*

<i>h</i>	Urs. Maj.	1 <sup>o</sup>	2 <sup>o</sup>	3 <sup>o</sup>	30'	29,55"
<i>v</i>	-	-	-	-	-	28,95
<i>m</i>	-	-	-	-	-	29,75
$\beta$	-	-	-	-	-	29,45
$\alpha$	-	-	-	-	-	29,50
<i>o</i>	-	-	-	-	-	29,05
Castor	-	-	-	-	-	29,86
Capella	-	-	-	-	-	29,55
Pollux	-	-	-	-	-	29,95
$\beta$ Aurigæ	-	-	-	-	-	29,35
Mean of 10						29,54
Sirius						29,47

There being no perceptible difference in the results obtained near the zenith and near the horizon, it may be concluded that the instrument has no deviation, either from flexion of the telescope or change of figure.